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(58) Field of search

C3V
C3U

(54) Powder compositions for producing tile adhesives and grouts

(57) The powder compositions comprise water soluble polymer and inorganic filler and can be used as or in powder adhesives, ready mixed adhesives and two part adhesives as well as grouting preparations. The water soluble polymer may be a natural, synthetic or semi-synthetic polymer.

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SPECIFICATION

Powder compositions

5 *Description*

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This invention concerns powder compositions suitable for adhesives and grout preparations.

With most ceramic tile adhesives fixing of the tiles to a substrate is more or less permanent, removal of tiles being very difficult. In fact if a change of tiling is desired removal of the old tiles tends to damage the substrate, which then has to be made good before retiling. Furthermore, if some tiles do fall off or

10 become loose it is difficult to remove the old adhesive which is necessary before the tiles can be refixed. 10

There exists, therefore, a need for an adhesive for fixing ceramic tiles that is strong enough to hold the tiles in place for as long as desired but from which tiles can be removed without damage and which can itself be readily removed.

It has now been found that certain powder mixes can be used to produce such an adhesive. It has 15 further been found that these powder mixes can be modified to produce relatively permanent adhesives and also grout preparations. 15

In these powder mixes, the essential ingredients, are believed to be water soluble polymer, as binder, and a filler, preferably an inorganic filler.

The water-soluble polymer used as a binder may be semi-synthetic, such as a cellulose derivative or a starch derivative. Examples of suitable cellulose derivatives are simple ethers, such as methyl cellulose 20 ether, ethyl cellulose ether, hydroxy ethyl cellulose ether, hydroxy methyl cellulose ether and hydroxy propyl cellulose ether, and mixed ethers, such as ethyl hydroxy ethyl cellulose ether, ethyl methyl cellulose ether and hydroxy propyl methyl cellulose ether. Examples of suitable starch derivatives are starch acetates, hydroxy ethyl starch and carboxymethyl starch. 20

25 The water soluble polymer may be a synthetic polymer, such as polyacrylic acids, polyacrylate, polyacrylamide, polyvinyl, alcohol, polyvinyl-methoxy acetate, polyvinyl methyl ether and polycarboxylic acid. 25

The water-soluble polymer may alternatively be a natural polymer or a derivative thereof, a polysaccharide or a protein. Examples of suitable natural polymers are galactomannans, such as locust bean gum and guar gum. A suitable polysaccharide is microbial polysaccharide, such as Xanthan gum, starch 30 and dextrine. Suitable proteins are casein, gelatin, animal hide and alginates. 30

The filler can be any mineral powder such as gypsum, calcium carbonates, silica sand, silica flour and clays. Examples of suitable calcium carbonates are limestone, whiting and marble. The fillers may be used singly or as blends of two or more types.

The powder mixes of the invention may be reinforced by the addition of redispersable powders, for 35 example, polyvinyl acetate homopolymer, polyvinyl acetate copolymers, such as vinyl acetate/ethylene copolymer and vinyl acetate/vinyl versatate copolymer. 35

Other optional ingredients of the powder mixes of the invention include rheological modifying agents, such as fumed silica, cellulose, kaolin and attapulgite, bulking agents such as expanded unmilled perlite, coalescing solvents and plasticisers which may be required to improve the film forming properties of the 40 polymer, dispersing agents or surfactants to improve and stabilise dispersion of the powder in water, 40 preservatives to protect the adhesive during storage and fungicides to protect the adhesive film in use.

Other ingredients may be included to modify the powder mixes according to its intended use and also to modify its performance.

The powder mixes of the invention are believed to be suitable for a variety of uses. Firstly by mixing 45 the powder with water, an adhesive suitable for fixing a variety of wall and floor coverings to a variety of substrates can be produced. The wall and floor coverings may be ceramic tiles suitable for wall or floor covering, mosaics such as of the paper-faced or mesh-backed types, plastic tiles, cork tiles, wood blocks, marble cladding, brick slips, terrazzos, favioures and slate tiles. Most sound, stable surfaces provide a suitable substrate and examples are cementitious backgrounds, wall boards, plaster, metal, wood, vinyl, 50 existing glazed tiled surfaces and even brickwork. An advantageous feature of the adhesives of the invention is that they contain no hydraulic components, such as cement, which makes them particularly useful on gypsum plaster substrates. It should be noted that the use of adhesives containing cement on gypsum plaster substrates is not recommended in BS 5385 Part 1 1976. 50

The adhesive can be used in any traditional method of tile or the like fixing, such as by thin- or thick-bed techniques, including application by notched trowels or solid-bed spreaders, or by buttering. Alternatively, the adhesive can be applied by being pumped onto the wall or floor surfaces. Another alternative could be to precoat the tiles with the adhesive which, when set, can be revived with water for fixing the tiles to a substrate. 55

(Details of suitable fixing techniques are given in BS 5385).

60 The powder mixes of the invention can be used to produce adhesives for sale in a ready mixed form. 60 For ready mixed adhesive preparations the redispersible powder may be replaced by a polymer emulsion, such as of polyvinyl acetate homopolymer emulsion, styrene/acrylate copolymer emulsion or styrene/butadiene rubber emulsion. These ready mixed adhesives may also include organic solvents.

The powder mixes of the invention may also be formulated into two part adhesive preparations, in which one part of the preparation would be the powder mix and the other part could comprise an aqueous solution or dispersion of a natural rubber latex or a styrene/butadiene rubber, an acrylic/styrene copolymer, polyvinyl alcohol or polyvinyl acetate and cellulose.

- 5 The adhesion strength of adhesives made from the powder mixes of the invention can be varied by the content of redispersible powder, polymer emulsion or water soluble polymer. With little or no such powder or emulsion, the adhesive is such that tiles can be readily removed from a substrate and the adhesive can be readily removed from the substrate and the tiles say by scraping, possibly with the assistance of wetting with water. The tiles are then reusable and the adhesive may be reconstituted by mixing with water and, optionally, further adhesive powder. 5
- 10 With greater amounts of the redispersible powder, emulsion or water soluble polymer the adhesion strength of the adhesive can be as good as conventional ceramic tile adhesives, i.e. exceeding the requirements of BS 5980. 10
- 15 The adhesion strength of adhesives of the invention can be further or alternatively improved by incorporation in the powder mix of styrene/butadiene rubber, natural rubber latex or acyclic polymers or polyvinyl alcohol. 15

% by weight

20	Water soluble polymer	1 - 50	20
	Inorganic fillers	30 - 80	
25	Redispersible powder or polymer emulsion (30-80% solids)	0-10	25
	Rheological modifying agent	0 - 5	
	Bulking agent	0 - 5	
	Preservative	0 - 1	
	Fungicide	0 - 1	
	Fillers	0 - 80	
	Water	0 - 80	

- 30 For flexibility, say for a movement joint, the adhesive compositions of the invention could include a styrene/n - butyl acrylate copolymer. For a decorative effect suitable pigments could be included and for a pleasant odour, perfumes may be included in the compositions of the invention. 30

- The compositions discussed above are believed not to be particularly suitable for fixing wall coverings subject to very damp conditions, such as externally or in swimming pools or shower cubicles. It may, however, be possible to modify the compositions of the invention to improve water resistance. 35

Whilst much of the discussion above has been with reference to adhesive preparations, the powder mixes of the invention may be modified so as to be suitable forming preparations that can be used as grouting material or as combined adhesive/grouting material.

This invention will now be further described by means of the following Examples.

- 40 *Examples* 40

Example 1

A powder adhesive composition for mixing with water was prepared by mixing the following ingredients in the amounts stated in parts by weight:

45	Hydroxy propyl methyl cellulose ether - viscosity 15,000 cps	15.3	45
	Aliphatic amide and heterocyclic sulphur containing compound mixture	2.0	
50	Expanded unmilled perlite	19.1	50
	China Clay - grade D	95.4	
55	Silica flour-mean particle size 22 μ	420.0	55

- To give an adhesive of suitable consistency for fixing ceramic tiles to a substrate the above powder composition was mixed with 450.4 parts by weight of water and left to thicken slightly for about ten minutes. The resultant adhesive was able to fix ceramic tiles to a substrate but the tiles were readily removable. After removal of the tiles, the adhesive could be scraped off both the tiles and the substrate for re-use of the tiles and the adhesive. 60

Example 2

Another powder adhesive composition for mixing with water was prepared as in Example 1 except that seed gum is used in place of the hydroxy propyl methyl cellulose ether but in the same amount.

This adhesive powder composition when mixed with 450.4 parts by weight of water gave an adhesive of similar properties to the adhesive of Example 1.

Examples 3 and 4

Adhesive powders having greater adhesion than the adhesives of Examples 1 and 2 were prepared from the same basic powder formulations as those of Examples 1 and 2 respectively but with the addition of 20 parts by weight of a vinyl acetate/vinyl versatate copolymer.

For use in fixing tiles, the powder was mixed with 450.4 parts by weight of water.

Examples 5 and 6

Adhesive powders having greater adhesion than the adhesives of Examples 1 and 2 were prepared from the same basic powder formulation as those of Examples 1 and 2 respectively but with the addition of 20 parts by weight of a vinyl acetate/ethylene copolymer.

For use in fixing tiles, the powder was mixed with 450.4 parts by weight of water.

Examples 7 and 8 Ready mixed adhesive compositions for use in fixing ceramic tiles were prepared from the same basic powder formulations as those of Examples 1 and 2 respectively by mixing with 450.4 parts by weight of water and 11 parts by weight of polyvinyl acetate homopolymer emulsion in water (53% solids).

Examples 9 and 10 Ready mixed adhesive compositions for use in fixing ceramic tiles were prepared from the same basic powder formulations as those of Examples 1 and 2 respectively by mixing with 450.4 parts by weight of water and 11 parts by weight of styrene/acrylate copolymer emulsion in water (45% solids).

It will be appreciated that the above exemplified compositions can have their viscosity adjusted by alteration of the amounts of the various ingredients. Furthermore, these formulations could be adjusted so that they could be used as grouting compositions.

CLAIMS

1. A powder composition for producing ceramic tile adhesives or grouts the composition comprising a water soluble polymer, as binder, and a filler or blend of fillers.
2. A composition as claimed in claim 1, wherein the polymer is semi-synthetic.
3. A composition as claimed in claim 2, wherein the polymer is a cellulose derivative or a starch derivative.
4. A composition as claimed in claim 3, wherein the cellulose derivative is an ether or a mixed ether.
5. A composition as claimed in claim 4, wherein the ether is methyl cellulose ether, ethyl cellulose ether, hydroxyethyl cellulose ether, hydroxymethyl cellulose ether or hydroxy propyl cellulose ether.
6. A composition as claimed in claim 4, wherein the mixed cellulose ether is ethyl hydroxy ethyl cellulose ether, ethyl methyl cellulose ether or hydroxyl propyl methyl cellulose ether.
7. A composition as claimed in claim 3, wherein the starch derivative is starch acetate, hydroxyethyl starch or carboxymethyl starch.
8. A composition as claimed in claim 1, wherein the water soluble polymer is a synthetic polymer.
9. A composition as claimed in claim 8, wherein the synthetic polymer is polyacrylic acid polyacrylate, polyacrylamide, polyvinyl alcohol, polyvinyl-methoxy acetate, polyvinyl methyl ether or polycarboxylic acid.
10. A composition as claimed in claim 1, wherein the water soluble polymer is a natural polymer or a derivative thereof, a polysaccharide or a protein.
11. A composition as claimed in claim 10, wherein the natural polymer is a galactomannans.
12. A composition as claimed in claim 11, wherein the natural polymer is locust bean gum or guar gum.
13. A composition as claimed in claim 10, wherein the polysaccharide is microbial polysaccharide.
14. A composition as claimed in claim 13, wherein the polysaccharide is xanthan gum, starch or dextrine.
15. A composition as claimed in claim 10, wherein the protein is casein, gelatin, animal hide or an algenate.
16. A composition as claimed in any one of claims 1 to 15 wherein the filler is an inorganic filler.
17. A composition as claimed in claim 16, wherein the filler is a mineral powder.
18. A composition as claimed in claim 17, wherein the mineral powder is gypsum, calcium carbonate, silica sand, silica flour or a clay.
19. A composition as claimed in any one of claims 1 to 18, comprising one or more redispersable powders.

20. A composition as claimed in claim 19, wherein the redispersable powders are selected from polyvinyl acetate monopolymer or polyvinyl acetate copolymers.

21. A composition as claimed in claim 20 wherein the polyvinyl acetate copolymer is vinylacetate/ethylene copolymer or vinyl acetate/vinyl versatate copolymer.

5 22. A composition as claimed in any one of claims 1 to 21 further comprising one or more of rheological modifying agents, bulking agents, coalescing solvents, plasticisers, dispersing agents, surfactants, preservatives and fungicides. 5

23. A composition as claimed in claim 22, wherein the rheological modifying agent is fumed silica, cellulose, kaolin or attapulgite.

10 24. A composition as claimed in claim 22, wherein the bulking agent is expanded unmilled perlite. 10

25. A powder composition as claimed in claim 1, having the following ingredients in the stated amount:

		%by weight	
15	Water soluble polymer	1 - 50	15
	Inorganic fillers	30 - 80	
20	Redispersible powder or polymer emulsion (30-80% solids)	0 - 10	20
	Rheological modifying agent	0 - 5	
25	Bulking agent	0 - 5	25
	Preservative	0 - 1	
	Fungicide	0 - 1	
30	Fillers	0 - 80	30
	Water	0 - 80	

26. An adhesive preparation for mixing with water for use comprising a powder composition as claimed in any one of claims 1 to 25. 35

27. A ready mixed adhesive comprising a powder composition as claimed in any one of claims 1 to 25.

28. A two part adhesive preparation comprising in one part a powder composition as claimed in any one of claims 1 to 25 and in the other part an aqueous solution or dispersion of a natural rubber latex or a styrene/butadiene rubber, an acrylic/styrene copolymer, polyvinyl alcohol or polyvinyl acetate and cellulose. 40

29. An adhesive preparation as claimed in claims 26, 27 or 28 further comprising a styrene/n-butyl acrylate copolymer.

30. An adhesive preparation as claimed in any one of claims 26 to 29 further comprising a pigment and/or a perfume or blend of perfumes. 45

31. A powder adhesive preparation as claimed in claim 1 and substantially as hereinbefore described with reference to any one of Examples 1 to 6.

32. A ready mixed adhesive preparation as claimed in claim 27 and substantially as hereinbefore described with reference to any one of Examples 7 to 10.